Importation of Swiss Chard, *Beta vulgaris* var. *cicla* from Peru into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the importation into the United States of **fresh swiss chard (*Beta vulgaris* var. *cicla*) grown in Peru**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low rather than numerical terms such as probabilities or frequencies. The details of methodology and rating criteria can be found in: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0*** (USDA, 1995); available from the individual named in the proposed regulations, or on the web site: www.aphis.usda.gov/ppq/bats/bant.

International plant protection organizations, *e.g.*, North American Plant Protection Organization (NAPPO) and International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO), provide guidance for conducting pest risk analyses. The methods used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. Our use of biological and phytosanitary terms, *e.g.*, introduction, quarantine pest, conforms with the *NAPPO Compendium of Phytosanitary Terms* (Hopper, 1996) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1996).

The *Guidelines for Pest Risk Analysis* provided by FAO (1996) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; the assessment is in response to a request for USDA authorization to allow importation of a particular commodity presenting a potential plant pest risk. In this case, the importation of **fresh swiss chard (*Beta vulgaris* var. *cicla*) grown in Peru** is a potential pathway for introduction of plant pests. Regulatory authority for the importation of fruits and vegetables from foreign sources into the U.S. is found in 7 CFR §319.56 .

2. Assessment of Weediness Potential of swiss chard, *Beta vulgaris* var. *cicla*

The results of the weediness screening (Table 1) did not prompt a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Beta vulgaris* var. *cicla* L. Swiss Chard (Chenopodiaceae)

Phase 1: *Beta vulgaris* var. *cicla* (Swiss chard, spinach beet, chard) is widely cultivated in the United States.

Phase 2: Is the species listed in:

NO	*Geographical Atlas of World Weeds* (Holm *et al.*, 1979)
NO	*World's Worst Weeds* (Holm *et al.*, 1977)
NO	*Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn and Ritchie, 1982)
NO	*Economically Important Foreign Weeds* (Reed, 1977)
NO	Weed Science Society of America list (WSSA, 1989)
NO	Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed").

Phase 3: Conclusion: Not reported to have weedy characteristics.

3. Previous Risk Assessments and Current Status

3a. Decision history for *Beta vulgaris*

1970 - Venezuela: Permit entry of beets without tops into Puerto Rico subject to inspection.
1972 - Venezuela: Permit entry of beets without tops into NY subject to inspection.

4. Pest List: Pests Associated with *Beta* spp.

The pest list in Table 2 was developed after a review of the information sources listed in USDA (1995). **Only those pests that would be associated with the above ground plant parts were included in this table.** The list summarizes information on the distribution of each pest, pest-commodity association, and regulatory history.

Table 2: Pest List - *Beta* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Alternaria alternata (Fr.)Keissl. (Fungi Imperfecti: Hyphomycetes)	Worldwide	o,v	Whitney and Duffus, 1986
Alternaria brassicae (Berk.) Sacc. (Fungi Imperfecti: Hyphomycetes)	PE,US	o	CMI, 1984a; Whitney and Duffus, 1986
Cercospora beticola Sacc. (Fungi Imperfecti: Hyphomycetes)	PE,US	o	Chupp, 1953; CMI, 1981; Whitney and Duffus, 1986
Fusarium culmorumm (W.G. Smith) Sacc. (Fungi Imperfecti:	PE,US	k,o	CMI, 1984b; Smith *et al.*, 1988
Macrophomina phaseolina (Tassi) Goid (Fungi Imperfecti: Coelomycetes)	PE,US	o	CPC, 1997
Peronospora farinosa (Fr.:Fr.) Fr. (Oomycetes: Peronosporales)	PE,US	o	CMI, 1988; FAO, 1993
Phoma betae A.B. Frank (Fungi Imperfecti: Coelomycetes)	PE,US	o	Bazan de Segura, 1959
Puccinia subnitens Diet. (Basidiomycetes: Uredinales)	PE,US	o	Crandall and Dieguez, 1948; Cummins, 1971; Whitney and Duffus, 1986
Rhizoctonia solani Kuhn Teleomorph: *Thanatephorus cucumeris*	PE, US	o	Bazan de Segura, 1959; Crandall and Diaguez, 1948; Whitney and Duffus, 1986
Sclerotinia sclerotiorum (Lib.) de Bary (Ascomycete: Sclerotiniaceae)	PE,US	o	CPC, 1997

Sclerotium rolfsii Sacc. (Agonomycetes) Teleomorph: *Athelia rolfsii* (Cars) T.U. & Kimbrough	PE,US	o	CMI, 1992; Whitney and Duffus, 1986
Uromyces betae Tul. ex Kickx	S.A.,US	o,v	Whitney and Duffus, 1986
Bacteria			
Agrobacterium tumefaciens (Smith & Townsend) Conn.	PE,US	a,o	Bradbury, 1986
Erwinia carotovora var.. *carotovora* (Jones) Bergey	Worldwide	o	Bradbury, 1986
Pseudomonas solanacearum (Smith) Smith	PE,US	o	Bradbury, 1986
Viruses			
Barley stripe mosaic hordeivirus	PE,US	o	EPPO, 1995
Beet mosaic virus	Worldwide	o,v	Whitney and Duffus, 1986
Cucumber mosaic virus	Worldwide	o,v	Whitney and Duffus, 1986
Arthropods			
Agrotis ipsilon (Hufnagel) (Lepidoptera: Noctuidae)	PE,US	o	CPC, 1997
Aphis fabae Scopoli (Homoptera: Aphididae)	PE,US	k,o,v,y	Blackman and Eastop, 1984; CPC, 1997; Duffus, 1986
Aphis gossypii Glover (Homoptera: Aphididae)	PE,US	k,o	Blackman and Eastop, 1984; CIE, 1968
Aulacorthum solani (Kaltenbach) (Homoptera: Aphididae)	PE,US	k,o	Blackman and Eastop, 1984; CIE, 1985
Diabrotica decempunctata (Latr.) (Coleoptera: Chrysomelidae)	PE	e	Condor, 1973
Diabrotica decempuncta sicuanica Bech. (Coleoptera: Chrysomelidae)	PE	e	Condor, 1973
Diabrotica speciosa (Germar) (Coleoptera: Chrysomelidae)	PE	e	INKTO, 1957
Diabrotica speciosa vigens Erichson (Coleoptera: Chrysomelidae)	PE	e	Condor, 1973
Diabrotica viridula optiva Erichson (Coleoptera: Chrysomelidae)	PE	e	Condor, 1973
Diabrotica viridula viridula Bechyne (Coleoptera: Chrysomelidae)	PE	e	Condor, 1973
Fiedlerella sp. (Coleoptera: Curculionidae)	PE	a	Condor, 1973
Herpetogramma bipunctalis Fabricius (Lepidoptera: Pyralidae)	PE,US	o	Zhang, 1994

Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae)	PE,US(CA, HI,TX,UT, WA)	h_4,z_i	EPPO, 1995; Gary *et al.*, 1986; Heinz and Chaney, 1995; Malais *et al.*, 1992; Spencer 1973; Spencer and Steyskal, 1986
Liriomyza sativae Blanchard (Diptera: Agromyzidae)	PE,US	o	CPC, 1997
Liriomyza trifolii (Burgess) (Diptera: Agromyzidae)	PE,US	o,z_i	EPPO, 1995
Macrosiphum euphorbiae (Thomas) (Homoptera: Aphididae)	PE,US	k,o	Blackburn and Eastop, 1984; CIE, 1984
Myzus persicae (Sulzer) (Homoptera: Aphididae)	PE,US	k,o,y	Blackburn and Eastop, 1984; CIE, 1979; Whitney and Duffus, 1986
Phthorimea operculella Zeller (Lepidoptera: Gelechiidae)	PE,US	o	CIE, 1986; EPPO, 1995
Pseudococcus viburni (Signoret) (Homoptera: Pseudococcidae)	PE,US	o,m	Williams and de Willink, 1992
Rhopalosiphoninus staphyleae tulipaellus (Theobald) (Homoptera: Aphididae)	PE,US	k,o	Blackburn and Eastop, 1984
Smynthurodes betae Westwood (Homoptera: Aphididae)	Worldwide	k,o,v	Blackburn and Eastop, 1984
Spodoptera eridania (Cramer) (Lepidoptera: Noctuidae)	PE,US	o	EPPO, 1995
Spodoptera frugiperda J.E. Smith (Lepidoptera: Noctuidae)	PE,US	o	CPC, 1997
Spoladea recurvalis (Frabricius) (Lepidoptera: Pyralidae)	PE,US	o	CPC, 1997
Tetranychus utricae Kock (Acari: Tetranychidae)	Worldwide	o,v	Jeppson *et al.*, 1975; Hill, 1987
Thrips tabasi Lind. (Thysanoptera: Thripidae)	PE,US	o	CIE, 1969; Hill, 1987

[1] Distribution legend: PE = Peru; US = United States; CA = California; HI = Hawaii; TX = Texas; UT = Utah; WA = Washington

[2] Comments:
- c = Listed in USDA's non-reportable dictionary as non-actionable.
- e = Although pest attacks commodity, it would not be expected to remain with the commodity during processing.
- h = Quarantine pest: pest has limited distribution in the U.S. and is under official control as follows: (1) pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity and, (2) pest is a program pest.
- o = Organism does not meet the geographic or regulatory definition of a quarantine pest.
- v = No specific reports of the pest from Peru, but regional reports exist and the pest may be present in Peru.
- y = Pest is a vector of plant pathogens.
- z_i = Internal pest: is known to attack or infest the commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of swiss chard from Peru is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of *Beta vulgaris* var. *cicla* quarantine action may be taken.

Table 3: Quarantine Pests:

Arthropods	*Diabrotica decempunctata*
	Diabrotica decempuncta sicuanica
	Diabrotica speciosa
	Diabrotica speciosa vigens
	Diabrotica viridula optiva
	Diabrotica viridula viridula
	Liriomyza huidobrensis

6. Quarantine Pests Likely to Follow Pathway (*i.e.*, Quarantine Pests Selected for Further Analysis)

Only those quarantine pests that can reasonably be expected to follow the pathway, *i. e.,* be included in commercial shipments of *Beta vulgaris* var. *cicla,* were analyzed in detail (USDA, 1995). Only quarantine pests listed in Table 4 were selected for further analysis and subjected to steps 7-9 below.

Table 4: Quarantine Pest Selected for Further Analysis:

Arthropods	*Liriomyza huidobrensis*

Other plant pests in this Assessment, not chosen for further scrutiny, may be potentially detrimental to the agricultural production systems of the United States; however, there were a variety of reasons for not subjecting them to further analysis. For example, they are associated mainly with plant parts other than the commodity; they may be associated with the commodity (however, it was not considered reasonable to expect these pests to remain with the commodity during processing); they have been intercepted as biological contaminants of these commodities during inspections by Plant Protection and Quarantine Officers but would not be expected to be present with every shipment. In addition, the biological hazard of organisms identified only to the generic level are not assessed due to the lack of adequate biological/taxonomic information. This lack of biological information on any given insect or pathogen should not be equated with low risk. By necessity, pest risk assessments focus on those organisms for which biological information is available. By developing detailed assessments for known pests that inhabit a variety of niches on the parent species, *i.e.* on the surface of or within the bark/wood, on the foliage, etc., effective mitigation measures can be developed to eliminate the known organism and any similar unknown ones that inhabit the same niches.

7. Economic Importance: Consequences of Introduction

The consequences of introduction were considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks are estimated by rating each pest with respect to five risk elements (USDA, 1995). Table 5 shows the risk ratings for these risk elements.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Liriomyza huidobrensis	high	high	medium	medium	high*	high

*This pest is know to attack members of the plant genera, *Trifolium, Vicia,* and *Vigna.* In the United States, *Trifolium stoloniferum, Vicia menziesii* and *Vigna o-wahuensis* are Federally listed endangered species.

We believe it would be reasonable to assume that this pest may attack these endangered plants. Because of existing legislation regarding endangered plants, we automatically gave these pests a risk rating of "high" for Consequence of Introduction.

8. Likelihood of Introduction

Each pest is rated with respect to introduction potential, *i.e.,* entry and establishment. Two separate components are considered. First, the amount of commodity likely to be imported is estimated. More imports lead to greater risk; therefore, the risk rating for the quantity of commodity is the same for all quarantine pests considered. Second, five biological features, (risk elements) concerning the pest and its interactions with the commodity are considered. The resulting risk ratings are specific to each pest. The cumulative risk rating for introduction was considered to be an indicator of the likelihood that a particular pest would be introduced (USDA, 1995). Table 6 shows our ratings for these risk elements.

Table 6: Risk Rating: Likelihood of Introduction

Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detected at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
Liriomyza huidobrensis	low	high	high	low	medium	medium	medium

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential combines the risk ratings for consequences and likelihood of introduction (USDA, 1995). The estimated pest risk potential for each quarantine pest selected for further analysis for the importation of Beta vulgaris var. *cicla* is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests

Pest	Pest risk potential
Liriomyza huidobrensis	high

Plant pests with a high Pest Risk Potential may require specific phytosanitary measures. The choice of appropiate sanitary and phytosanitary measures to mitigate risk is undertaken as part of Risk Management and is not addressed, *per se*, in this document.

PPQ has 40 plant pest interceptions from the leaves and stems of *Beta* spp. from other areas; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in Peru in addition to other quarantine pests and have been intercepted as hitchhikers with other commodities. Should any of these pests be intercepted on commercial (or any other) shipments of *Beta vulgaris* var. *cicla*, quarantine action may be taken.

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